

## CLOSING REMARKS

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When I spoke to the New England Botanical Club (NEBC) last year about a naturalist's perspective on science education, I approached the task with a bit of trepidation, for I have been working outside of a formal academic institution for nearly 20 years. Providing the epilogue for today's symposium is slightly more daunting.

A word for those who may be new to the NEBC: the NEBC has been around a long time. This is a wonderful association of academic and amateur botanists who have been sharing their work and experiences on the first Friday of the month since 1896. David Barrington, a professional, academic botanist, and Les Eastman, a self-trained amateur, introduced me to the NEBC 23 years ago this month. I clearly remember Friday evenings in the room at the top of this building, participants packed between glass-topped cases of Richard Evans Shultes' ethnobotanical collections to listen to a young man named Michael Donoghue talk about *Acer* and *Viburnum* in the mountains of Mexico. Or, a similar crowd listening to Les tell stories of searching for orchids in cedar swamps of Aroostook County, Maine, with George Newman and some eager student by the name of Les Mehrhoff in tow. So when the committee asked me to wrap up this day, I looked back there for some inspiration.

If you read through the early numbers of *Rhodora*, you will find reports of expeditions, explorations, and investigations that provided some of the academic foundations for the reports that you listened to today. Certainly that is the case for the paleoecological investigations of George Jacobson and Ray Spear, which elucidate dramatic changes in the structure of the forests, upper elevational limits of species, shifts in treeline, and linkages of these changes to fluctuations in temperature and other measures of climate. Ray Spear's work in the mountains, in particular, could be a page right out of Fernald's work, had he lived to be 130.

Notable for those of us who love to think about the mountains, the 700 year period during the Younger Dryas, when average

annual temperatures are estimated to have changed 5–10°C, must have wrecked havoc on the prior (relative) stability of the post-glacial alpine tundra vegetation and its associated mega-herbivores. During the last 20,000 years our New England flora has been transformed through the utter devastation of an ice age and the somewhat more subtle influences of human commerce—not only with axes and skidders in the 19th and 20th centuries, but schooners and a thirst for riches that sent (mostly) northern European people around the globe at a frantic pace in the 16th, 17th, and 18th centuries, with microbes, pathogens, plant propagules, rats, and pigs in tow (Crosby 1986).

Notable among their contributions, Charlie Cogbill, David Foster, and Les Mehrhoff have shown us the irrefutable value of the written human record for elucidating the presettlement and early colonial forests and associated vegetation of this region. I admit a great affection for studies that combine evidence gleaned from multiple disciplines, and today's presentations fit the bill. Our modern-day concerns about rapid plant migrations, and the extraordinary loss of populations and whole species to both habitat destruction and displacement by aggressive intruders, takes on a whole new hue when we consider that it is just the most recent wave of the biological expansion. *Trifolium repens* was an early scout, now found on every continent. Sara Webb's studies of *Acer platanoides* show us just how aggressive are some of these relative newcomers to our flora.

The work presented today represents hundreds (if not thousands) of years of collective inquiry, investigation, and analysis. I know for certain that at least one of our speakers has years of unfinished work stretched out before him—am I not right, Charlie (Charles V. Cogbill)? I owe him notes and descriptions of vegetation for at least two remote mountain peaks in Maine before he can complete his exhaustive survey of alpine vegetation in northern New England and New York.

In the remaining few minutes of this celebratory symposium, I offer a few thoughts and an announcement about future botanical explorations—what you and your students ought to be thinking about for work in the coming century. I offer these thoughts with that certain trepidation that comes before telling someone with more experience what they ought to be doing with their life, but . . . why not?

Many of you know that I have been railing for years that the

science of our late 20th century is a fragmented discipline. Students and the general public are poorly prepared to solve problems, not knowing where to begin to address landscape-scale issues in botany, zoology, or ecology, let alone contribute to discussions affecting public policy and the stewardship of natural resources.

**Thought # 1: Teach.** Or, inspire learning! The numbers wouldn't mean too much, but I'll wager that the general public knows less of the world of (whole) plants in 1999 than they did in 1899. There are certainly fewer botany or plant science majors on most campuses that still support the discipline than there were in 1900 or 1950 or even 1975. Please correct me where I may go wrong here. We're all smart enough to do something about that, but it means creating a working environment that invites participation by the sheer energy and high quality of its intellectual inquiry.

Notably, Richard Primack's efforts in restoration ecology have provided a touchstone for the residents of Newton, and I imagine that his particular botanical genius has already infected a generation of future botanists. Community members experience the exhilaration of having "made a difference," and I'd wager that Richard gets a real lift by sharing in that enthusiasm. And, as a result, we know a lot more about the establishment of perennial plants in new environments.

You know I love to explore, most recently on Baffin Island in Nunavut, so the next thought should come as no surprise.

**Thought # 2: Travel and explore with students and friends.** As the stationary tools and aids to learning continue to amaze and distract us, so I think we need to redouble our effort to get teams of collaborative learners and teachers into the field, if for no other reason than to avoid William Morton Wheeler's "dry rot of academic biology." You may not have read Wheeler's humorous analysis of the state of biology, delivered in Boston 75 years ago, as the Presidential Address to the American Society of Naturalists (Wheeler 1923). He said that we suffered then from an academic form of *Merulius lacrymans*, or the dry-rot fungus:

"Undoubtedly the best culture medium for the academic dry-rot fungus consists of about equal parts of narrow, un-

sympathetic specialization and normal precocious senile abstraction.”

In his own fight against the tyranny of specialization, Wheeler preferred “natural history” to “ecology,” then a young branch of our life sciences. He stated:

“History shows that throughout the centuries, from Aristotle and Pliny to the present day, natural history constitutes the perennial root-stock or stolon of biological science and that it retains this character because it satisfies some of our most fundamental and vital interests in organisms as living individuals more or less like ourselves.”

Herb Wagner’s poignant review of the past 50 years of botanical research, and especially the merciless tug-of-war on the psyche of the field and herbarium worker, is telling, particularly in light of Wheeler’s earlier comments. Modern systematists have had to adapt to increasingly more frequent changes in techniques and tools, from the early population studies of the likes of Greg Anderson and Charlie Heiser, through the era of numerical taxonomy, countless chemical analyses, to sizing gels and power supplies. These days our work spaces resemble a forensic lab and not an herbarium.

A couple of years ago, I attended a conference in St. Charles, Illinois, sponsored by a world-wide business consulting firm, Arthur Andersen, for both school people and business people. Our presenters predicted some significant changes to the structure of our primary and secondary schools across the country by 2050. A few of those predictions:

- No school building with more than 150 students
- Multi-age classrooms and learning groups
- Teachers as facilitators of learning not dispensers of “the truth”

If anecdotes are worth anything, more and more matriculating freshmen have experienced the positive jolt to learning of well-guided independent study years before entering our hallowed halls. We risk losing them to more stimulating alternative experiences unless we help them take the reins for their learning at the earliest possible age. Many of the graduates of the Maine Coast Semester at the Chewonki Foundation, all of whom are attending or have

graduated from places like this (Harvard University), still tell me years later that their 16 weeks on the coast of Maine surpassed everything else for an academic experience . . . “I learned more, etc.”

Back at work we are embarking on a new project with the Smithsonian’s Arctic Studies Center, the Quebec/Labrador Foundation, and the Center for Northern Studies. The ultimate goal is to put college-aged students in the field with experienced professionals like yourselves, helping to establish local, community-based archaeological, historical, ecological, economic, and environmental projects in the Great Northern Peninsula of Newfoundland, along the Labrador Straits, and north, past Nain, to the Torn-gats.

We are making a deliberate effort to practice E. O. Wilson’s concilience (Wilson 1998). At the risk of repeating myself, I’ll pitch that idea again this year. You will recall that Wilson lamented the lack of interest in “the big picture” and urged us to find consilience, literally a “jumping together” of knowledge, between our many and fragmented disciplines of science and the humanities. He said:

“A balanced perspective cannot be acquired by studying disciplines in pieces: the concilience among them must be pursued. Intellectually it rings true, and it gratifies impulses that arise from the admirable side of human nature. To the extent that the gaps between the branches of learning can be narrowed, diversity and depth of knowledge will increase. They will do so because of, not despite, the underlying cohesion achieved. The enterprise is important for yet another reason: It gives purpose to intellect. It promises that order, not chaos, lies beyond the horizon. Inevitably, . . . we will accept the adventure, go there, and find what we need to know.” (p. 62)

As most of you know, the coast of Labrador looks and feels like the top of Katahdin or Mt. Washington. Places like this will “bring ’em in,” believe me. I’ll wager that four weeks in Labrador will do more to sink the hook in a larval botanist, archaeologist, or even a post-industrial economist than four years hanging around the usual haunts with the usual suspects. But, I digress! Back to the business at hand.

Many of us have more than a mild interest in questions about

plant migrations in a world facing some potentially dramatic shifts in climate during the coming century. How will our plant and animal communities respond to predicted increases in annual mean temperature? What might we expect to see or measure in our New England mountains, or farther north along the coast of Labrador? When the Baxter State Park Advisory Committee asked me a dozen years ago what effect the reintroduction of caribou might have on the Tableland of Katahdin, I shrugged and said that, “Whatever the change, we would never really get the measure of it.” Beyond a plant list, there was precious little information in the record on the structure of plant communities on that summit—no baseline data.

**Thought # 3: Take good notes, the world may be changing fast!** If you haven’t established some long-term study plots to re-visit in your retirement, this summer is not too late. Take great care to collect good specimens with exquisite notes and details for the labels.

**Thought # 4: Share what you and your students are learning.** Or, put another way, publish in *Rhodora*!

To that end, it gives me the greatest pleasure to be able to announce this afternoon the establishment of a special award, offered by the New England Botanical Club, named for the most prolific contributor to our journal, the “boss” himself. The Merritt Lyndon Fernald Award will be presented each year to the author or authors of the paper published in *Rhodora* judged best to exemplify the goals and objectives of the journal (and the NEBC) to promote our knowledge and understanding of the world of plants.

So, there you have it. Inspire learning. Get yourself and your students into the field, perhaps with colleagues from neighboring, or even distant disciplines. Improve your data collection, and establish some permanent plots for long-term study; the world is changing fast. Make collections, pay attention to preserving the record, and publish regularly in *Rhodora*.

#### LITERATURE CITED

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